

SECTION 10401
METAL SIGN FRAMES

PART 1 - GENERAL

0.1 DESCRIPTION OF WORK

- A. Work Included: This Section specifies the following items.
1. Station Identification and Wayfinding signs as indicated - porcelain enamel on steel
 2. Maps - Line, RTL, Neighborhood, Bus Neighborhood maps - porcelain enamel on steel
 3. Historic Interpretive Murals - porcelain enamel on steel
 4. Sign frames and mounting accessories as indicated and required
- B. Related Work:
1. Section 05500 - MISCELLANEOUS METAL.
 2. Section 07920 - JOINT SEALANT.
 3. Section 09900 - PAINTING.
 4. Section 10100 - DISPLAY CASES.
 5. Section 10400 - FIXED SIGNAGE.
 6. Section 10426 - TACTILE /BRAILLE SIGNAGE.
 7. Section 10428 - MBTA LOGO LOLLIPOP SIGN.
 8. Section 16000 - ELECTRICAL - "Exit" signs; and "Variable Message Signs".
- C. Transportation: Deliver all sign frames and mounting hardware, to the job site.
- D. Temporary: Provide fabrication, erection, and removal of any and all temporary safety barricades, temporary holding, retaining or storage structures necessary as described herein
- E. Permits: Obtain permits required by Local Authorities for installation of signs and frames.

0.2 PERFORMANCE REQUIREMENTS

- A. Performance Requirements for Fixed Signage Metal Frame Work.
1. Design Criteria: Design, fabricate, and install sign frame items to withstand normal exposure to weather, temperature variation, wind loads and building movement; provide units resistant to vandalism and theft.
 2. Field Measurements: Check actual locations of construction - to which metal fabrications must fit - by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
 3. The drawings indicate minimum dimensions and thicknesses for components. Where performance requirements necessitate thickness of material to be increased or additional reinforcing to be added such

revisions shall be made without changing the visible profiles of in-lay elements. Where changes cannot be made without changing visible profiles they shall be made only with approval by the MBTA Capital Delivery Department.

4. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing signs to prevent buckling, opening of joints, over-stressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
 - a. Temperature Change (Range): 0 - 180 deg F ambient, material surfaces.
5. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials. Insulating materials shall not be visible to public view in final configuration.

0.3 SUBMITTALS

- A. All submittals shall be provided to both the Designer of Record and the MBTA Capital Delivery Department for review; disposition and documentation management will be provided by the Designer of Record.
- B. Product Data: Manufacturer's product data, any limitations and recommendations for each material used, installation instructions, and manufacturer's certification (stating that materials comply with requirements) for the Designer of Record and MBTA Capital Delivery Department's review and approval.
- C. Engineering and structural analysis for metal sign and new or reused frame work, as well as necessary calculations, shall be prepared under the supervision of, and signed and sealed by, the Designer of Record. These calculations shall include gravity, wind, and seismic loading. The internal structure, dimensions and specifications for all items shall be indicated in the Contract drawings, and shall be indicated in the Contractor's shop drawings. The Designer of Record shall engineer signs to a proper level to withstand abuses of their environment.
- D. Shop Drawings: Submit shop drawings for fabrication and installation of each sign assembly, including, but not limited to: sign frames and associated sign panels drawings, plans and elevations; sign content elevation (from SIGNmaker™ 1/2"=1'-0" elevation export file); and large-scale details of each sign frame and sign panel showing all required mounting holes, slots, clips, flanges, and other integral fastener components and accessory items. Shop drawings must be provided within 30 days of receiving signage plan and 1/2"=1'-0" elevation export file from MBTA. After action, provide copies of shop drawings on which action has been taken to the Designer of Record and MBTA Capital Delivery Department for the Designer of Record and MBTA Capital Delivery Department's records.

- E. Reuse of Existing Sign Frames: Reuse is only permissible if frame meets performance requirements and quality assurance. For reuse of existing frames, verify rough opening of all dimensions and provide measurements to MBTA Capital Delivery Department. Advise the MBTA and Designer of Record of any discrepancies between design size and field-verified size.
- F. Frame Field Measurements: Provide measurements of frame openings to MBTA Capital Delivery Department. Final graphics export will be based on field verified sizes.
- G. Mock-ups: Provide mock-ups in place of each frame type including; suspending, spanning, surface mounted, and freestanding for locations as determined by the MBTA Capital Delivery Department, to verify selections made under sample submittals and to demonstrate aesthetic effects and quality of materials and execution. Build mock-ups to comply with the specified requirements, using materials indicated for final unit of Work. If required, mock up shall include both welded and mechanical connections. Welded connections shall be done in the shop, and not visible in final configuration as approved by Designer of Record, MBTA Capital Delivery Department, and MBTA Sign Shop. Mechanically attach signage in field.
 - 1. If the Designer of Record and MBTA Capital Delivery Department determine mockups do not comply with requirements, provide new corrected frames until mockups are approved.
 - 2. Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Installer: Installer shall be trained or certified by the manufacturer to perform work. Manufacturer shall certify installer as acceptable for terms of warranty.
- I. Certificates: Welder and weld procedure qualifications.
- J. Weld inspection reports.

0.4 QUALITY ASSURANCE

- A. MBTA Reference Standards: Comply with the MBTA Signage Guidelines V 03.2015.
- B. Reference Standards: The work shall conform to the codes and standards of the following regulatory Agencies and Authorities as further cited herein:
 - 1. ADAAG: Americans with Disabilities Act Accessibility Guidelines
 - 2. ANSI: American National Standards Institute.
 - 3. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103 as published in "Compilation of ASTM Standards in Building Codes".
 - 4. MAAB: Massachusetts Architectural Access Board.
 - 5. AWS D1.1, Structural Welding Code – Steel
 - 6. AWS D1.2, Structural Welding Code – Aluminum
 - 7. AWS D1.1, Structural Welding Code – Sheet Steel

8. AWS D1.1, Structural Welding Code – Stainless Steel
- C. Source: For each type of material required for the work of this section, provide Single-Source Responsibility. This local Single-Source supplier will control coordination and installation of Frames and Fixed Signage.
- D. Installer Qualifications: Installation of sign frames specified in this Section shall be performed by the fabricator. Fabricator Qualifications: The approved fabricator shall have a minimum of 5 years of successful experience with metal frame work, and shall have a reputation for doing satisfactory work on time and shall have recently successfully completed similar work.
- E. Galvanizer Qualifications: Engage the services of a qualified galvanizer who has demonstrated a minimum of five years experience in the successful application of galvanized coatings. For specific requirements, galvanizer shall comply with the specification Section – 05055 and 09900.
- F. Welding Standards: Comply with applicable provisions of the American Welding Society AWS D1.1 "Structural Welding Code".
1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- G. Coordination: The work in this Section shall be completely coordinated with the work of other Sections. Verify dimensions and work of other trades that adjoin materials of this Section before the installation of items herein specified. Cooperate with such trades to assure the steady progress of all work under this Contract.
- H. Project Meetings: The signage contractor and related subcontractors shall be required to attend project meetings at the Project site when required by the Designer of Record and MBTA Capital Delivery Department.
- I. Certification: Submit manufacturer's certification that materials furnished comply with requirements specified.
- J. Inspection: Except as otherwise specified, only visual inspection of welds, materials, workmanship, finished products, and installation.
- K. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of each frame installed to the MBTA, including precautions for use of cleaning materials and solvents for paint removal, which could damage surfaces.
- L. Warranty:
1. Submit a written Manufacturer's warranty for MBTA acceptance, signed by the manufacturer, agreeing to repair or replace panels that fail during the specified warranty period. Warranty begins at substantial completion. Failures include, but are not limited to, the following: Coating degradation or structural failure.
2. Warranty Period: Steel Frames – 30 years; Aluminum – 10 years.

3. The Manufacturer's warranty is in addition to, and not a limitation of, other rights the MBTA may have under the Contract Documents.

0.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store work under this Section in a manner to prevent the cracking or stress of components, and to prevent mechanical damage or damage from the elements.
- B. Deliver and store frames in wooded crates surrounded by sufficient packing material to ensure products will not be damaged.
- C. Deliver work under this Section to Site in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts, but minimize on-site storage.

0.6 PROJECT CONDITIONS

- A. Inspection of Site: The Contractor shall visit the site of the proposed work and become fully acquainted with existing conditions, and to become fully informed as to the facilities involved and the difficulties and restrictions attending the performance of the Contract, prior to submitting a price quotation.
- B. Substrates: Proceed with work of this Section only when substrate construction and penetration work have been completed.

0.7 SEQUENCING AND SCHEDULING

A.

General approach: signs will not be fabricated until sign frames have been fabricated to the satisfaction of the Capital Delivery and the Designer of Record; sign frames and frameless signs housed within architectural and/or structural spaces will not be fabricated until those spaces have been created, and shop drawings reflect their actual dimensions.

Pre-Construction Conference: Contractor shall attend a pre-construction conference with MBTA Capital Delivery, and the Designer of Record, sign frame fabricator, and sign fabricator. The agenda will include: signage scope of work, schedule, including expected lead times, submittal process and the critical path to completion. Discuss minimum clearances of signs, based on the anticipated thickness of finish galvanization, paint, and construction tolerances. Included in this discussion is the workflow below, which includes related work in Fixed Signage specification Section 10400:

1. MBTA Capital Delivery shall provide 1/2" scale png sign files for use by the sign installer, and a field measurement schedule in Excel format, requiring field measurements of all locations where the signage frame is housed within architectural and/or structural elements.

2. MBTA Capital Delivery will determine which signs and frames will be mocked up.
3. The Contractor shall provide Porcelain Enamel color samples (See Fixed Signage Specification 10400), a completed field measurement schedule in Excel format (1.3.F), and frame shop drawings. (1.3.C, 1.3.D)

Mockups (may run concurrently with 4-7)

- 3a. MBTA Capital Delivery shall provide: Full scale digital .eps files with revised measurements to contractor (See Fixed Signage Specification 10400).
- 3b. Contractor issues: Full sized digital and paper proofs of sign elevations using .eps files (See Fixed Signage Specification 10400).
- 3c. Upon approval, CD and Designer of Record shall issue a notice to proceed on fabrication of sign and sign frame mock-ups.
- 3d. Upon satisfaction with mock-ups, the CD and Designer of Record shall issue a notice to proceed with fabrication of sign frames for locations not dependent upon construction of structural and architectural elements.
4. Upon construction of the structural and architectural elements that will house sign frames and frameless signs, the contractor shall revise the shop drawings and field measurement schedule if indicated, and submit to CD and the Designer of Record for approval.
5. Upon satisfaction, MBTA Capital Delivery shall provide: Full scale digital .eps files with revised measurements to contractor (See Fixed Signage Specification 10400)
6. Contractor issues: Full sized digital proofs and paper proofs of sign elevations using .eps files (See Fixed Signage Specification 10400)
7. Upon approval of digital and paper proofs, and assuming satisfaction with mock-ups, CD and Designer of Record shall issue a notice to proceed with fabrication of sign frames and all associated mounting elements, and with those signs not requiring sign frames.
8. Fabrication of signs requiring sign frames (See Fixed Signage Specification 10400) shall not proceed until the sign frames have been fabricated, and have been approved by MBTA Capital Delivery and the Designer of Record for conformance with shop drawings, including size, fit, and quality of fabrication and finish. At no time is the contractor to alter digital artwork provided by MBTA to fit frames. Delivery of approved frames shall occur a minimum of 180 days prior to anticipated date of Substantial Completion, to allow adequate time for fabrication and delivery of porcelain enamel sign panels.

PART 2 - PRODUCTS

0.1 MATERIALS AND PRODUCTS

- A. Structural steel materials, details and workmanship shall conform to the specifications of the latest edition of the A.I.S.C. Specifications for the Design, Fabrication, and Erection of Structural Steel Buildings. ASTM standards:
 - 1. Extruded Bars and Shapes: ASTM B 221 (ASTM B 221M), 6063-T6.
 - 2. Plate and Sheet: ASTM B 209 (ASTM B 209M), 6061-T6.
 - 3. Die and Hand Forging: ASTM B 247 (ASTM B 247M), 6061-T6.
 - 4. Castings: ASTM B 26/B 26M, A356-T6.
- B. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. High strength bolts other than anchor bolts, nuts and washers shall conform to ASTM-A325. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- C. Tamper Resistant Fasteners: shall be stainless steel, 3/8" dia. button head Phillips socket pinhead.
- D. Threaded Studs: shall be low carbon mild steel with minimum yield strength of 50,000 PSI.
- E. All hardware shall be as indicated on drawings: 316 stainless steel, or galvanized per ASTM-A153 requirements.
- F. Where mechanical fasteners and hardware are required, they shall be of adequate thickness, length, and constructed to properly secure the sign unit. Any visible portion of any mounting device shall be finished to match adjacent sign frame surface, unless otherwise specified.
- G. Non-metallic Washers: Provide rigid neoprene separators between fasteners and non-compatible materials being joined.
- H. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AS specifications, and as required for color match, strength, and compatibility in the fabricated items.
- I. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, complying with DOD- P-21035 or SSPC-Paint 20.
- J. Separate dissimilar metals

0.2 FABRICATION

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limits. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Fabricate work to be truly straight, plumb, level, and square.
- C. Work Exposed to View: Take special care in choosing materials that are smooth and free of blemishes such as pits, roller marks, trade names, scale and roughness. Fabricate work with uniform, hairline tight joints. Form welded joints and seams continuously and grind flush and smooth to be invisible after painting. For exposed fasteners, use hex head bolts or Phillips head machine screws, or acorn head screws and bolts as indicated.
- D. Welded Connections: Perform welding to comply with AWS for recommended practices, using method appropriate for metal and finish indicated. Grind exposed welds flush and smooth to blend with adjoining finish metal surfaces. Maintain open joint clearances as indicated in drawings.
- E. Cut, drill, and tap as indicated to receive finish hardware, screws, and similar items metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water accumulates.
- G. Provide frames complying with A-F to Hot-Dip Galvanizer, notify Designer of Record and MBTA Capital Delivery Department for inspection prior to Hot-Dip Galvanizing,

PART 3 - EXECUTION

0.1 INSPECTION

- A. The Installer shall examine substrates, supports, and conditions under which this work is to be performed, and notify the Contractor and the Designer of Record in writing of conditions detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected. Beginning work means Installer accepts substrates and conditions.
- B. Notification Point: The Designer of Record and MBTA Capital Delivery Department will be given 72 hour notice to perform field inspection at the start of installation of signage. If work does not meet project requirements, contractor must remove and replace deficient work.

0.2 INSTALLATION/APPLICATION/ERECTION

- A. Strictly comply with approved shop drawings and manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
- B. Install work plumb, level, and in true plane and alignment using mounting methods indicated.
- C. Protect adjacent or adjoining surfaces and work from damage during installation in this Section.
- D. Work shall be designed and anchored so that work will not be distorted nor the fasteners overstressed from expansion and contraction of metal or other materials as applicable.
- E. No field welding of sign frames. Field welding of attachments shall be allowed as required and approved by engineer. Welds shall not be visible in final configuration. Repair surfaces as per Section - 05041.

0.3 TOLERANCES

- A. The following installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work:
 - 1. Allowable Variation from True Plumb, Level and Line: Plus or minus 1/32 inch from true position for signage smaller than 24 by 24 inches in size; plus or minus 1/16 inch from true position for signage 24 by 24 inches in size and larger.
 - 2. Allowable Variation from True Plane of Adjacent Surfaces: Plus or minus 1/16 inch.

0.4 CLEANING AND PROTECTION

- A. Adjust work to present the best possible appearance. Touch-up damaged finishes and eliminate any evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully repaired or cleaned. Designer of Record and MBTA Capital Delivery shall be final authority on acceptance of repaired work.
- B. Provide temporary protection to ensure work is delivered without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.
- C. Touch-up Painting: Immediately after erecting, clean bolted connections and abraded areas as specified in Section - 05041.
- D. Manufacturer shall provide Authority with information on cleaning and maintenance recommendations for all signs.

- E. Names, stamps and decals of manufacturers, installers or maintainers of signs shall not be visible in the finished work. All assembly markings shall not be visible in the finished work.

PART 4 - MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Separate measurement and payment will not be made for work under this section, but all costs in connection therewith are included in the contract price as identified in Section 01015 - SCHEDULE OF PRICES.

END OF SECTION